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## United States Department of Agriculture,

## DIVISION OF BOTANY.

## THE SEED OF BEARDLESS BROME GRASS.

The introduction of beardless (also called smooth, Hungarian, and awnless) brome grass (*Bromus inermis*) into the arid and semiarid regions of the West and Northwest has given the people of those States a pasture and meadow grass of great promise. It has already been proved that it will succeed under conditions that prove fatal to timothy, orchard grass, or alfalfa. The area planted is constantly increasing,

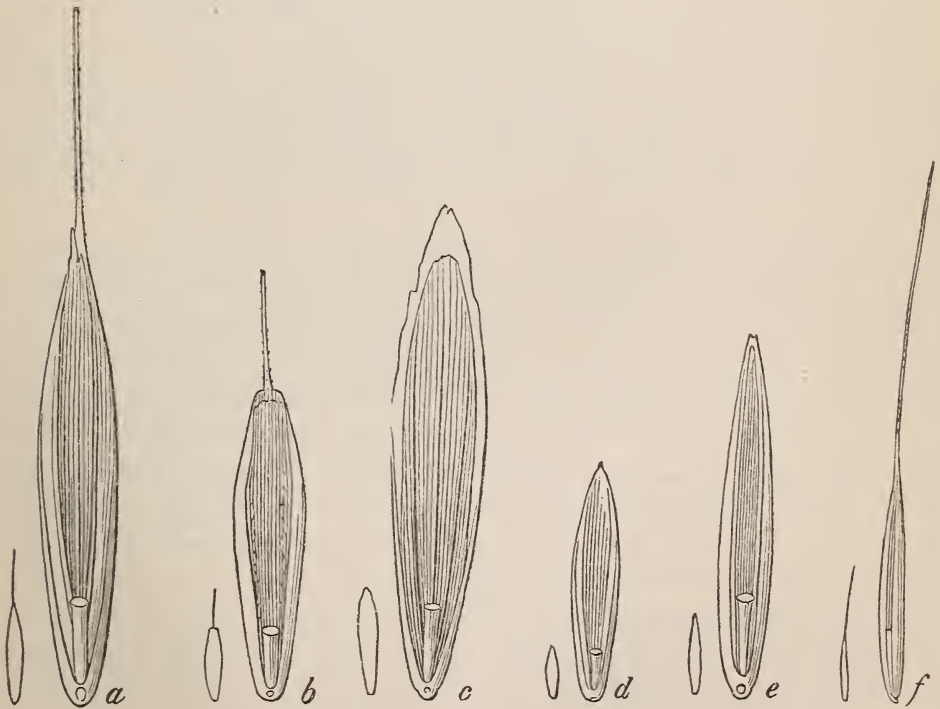


FIG. 1.—Beardless brome grass and impurities. *a*, Upright brome grass (*Bromus erectus*); *b*, chess (*Bromus secalinus*); *c*, beardless brome grass (*Bromus inermis*); *d*, meadow fescue (*Festuca pratensis*); *e*, quack grass (*Agropyron repens*); *f*, a fescue grass (*Festuca bromoides*). The small figures are natural size.

and the demand promises to be greater this spring than ever before. It is desired, therefore, to call attention to the characters of the seed, the points determining its quality, and some of the possible adulterants, besides suggesting simple methods by which buyers may themselves test their seed.

## WEIGHT OF BEARDLESS BROME GRASS SEED.

The standard weight of beardless brome grass is 14 pounds per bushel, but this weight is seldom attained. Out of many samples tested at the seed laboratory only two weighed more than 13 pounds per bushel and the average was much less. The two that weighed more were grown in Oregon and weighed  $16\frac{1}{2}$  and  $20\frac{1}{2}$  pounds per bushel, respectively. The light weight of the commercial seed is due to the presence of chaff and empty glumes, chiefly the latter. These empty glumes are the fruits that for some reason have not been fertilized and consequently do not contain a grain. It is difficult to separate all of these from the good seed, especially in unfavorable seasons when much of the seed is poor.

## POINTS THAT DETERMINE THE VALUE OF A SAMPLE.

If adulterants are not present and the germination is good, the weight per bushel is a fair index of the worth of any lot of brome grass seed. Besides the weight per bushel the two points of importance are the presence or absence of injurious weed seeds and adulterants and the percentage of germination. Owing to the thick-growing habit of beardless brome grass, weeds have little chance to become troublesome and are soon choked out. There may be exceptions to this, however, and, especially when imported seed is used, it will be well to look with suspicion on any unknown plant that makes its appearance.

The presence of adulterants is more serious, as they are often in sufficient quantity to considerably decrease the amount of good seed obtained for the money and to occupy a large part of the field to the exclusion of the brome grass. The samples so far examined at the seed laboratory this year have not been adulterated, but during 1898-99 several lots tested were found to contain from 25 to 40 per cent of an adulterant. Some of these samples were sold by reputable firms, and there is little doubt that these seedsmen were themselves deceived. The farmer, however, pays a high price for the seed, and for his protection he should demand that every lot be accompanied with a statement of the percentage of purity and germination. If for any reason it is desired that these percentage statements be verified, the buyer can either make a test himself or send samples to his State experiment station or to the U. S. Department of Agriculture.

## PERCENTAGE OF GERMINATION.

The average germination of good seed is from 80 to 90 per cent, and really choice samples will test as high as 95 per cent. The average of 27 tests made since October, 1899, has been 82 per cent, and of one sample 99.5 per cent germinated. The American-grown samples were uniformly the purest and of the strongest vitality. They were grown in North Dakota, Minnesota, Oregon, Canada, and Manitoba.



## AMOUNT OF SEED NEEDED PER ACRE.

The amount of seed recommended per acre varies from 12 to 40 pounds, but 15 to 20 pounds is usually thought to be sufficient. This difference in opinion is doubtless due to the great difference in the quality of the seed, since poor seed must be sown more thickly than good seed to produce similar results. If it is found that 15 pounds of pure and germinable seed are needed for an acre it will be possible to tell how much of a given commercial sample to use when one has ascertained the percentage of good seed it contains.

A comparison of two samples sold this year will serve to illustrate: Sample No. 1 was Oregon-grown and sample No. 2 was imported. Sample No. 1 had 96 per cent pure seed and 91 per cent of this germinated. The amount of pure and germinable seed was, then, 91 per cent of 96 per cent, or 87.3 per cent. In other words, in every 100 pounds purchased there were 87.3 pounds of good seed. To get 15 pounds of good seed on his land the farmer would therefore have to use a little more than 17 pounds of sample No. 1.<sup>1</sup> Sample No. 2 had 52 per cent pure seed, of which 80 per cent sprouted. There was therefore 41.6 per cent of good seed, and the farmer needed 38 pounds of sample No. 2 in order to sow 15 pounds of good seed. This is more than twice as much as would be needed if sample No. 1 were used. Sample 2 was worth to the farmer less than half as much as sample 1.

## HOME TESTING OF BEARDLESS BROME GRASS SEED.

Testing the purity and vitality of grass seed is usually rather difficult for the farmer, but owing to its large size and well-marked shape, something may be done with brome grass. Beardless brome grass seed (fig. 1, *c*) is larger than any of the common agricultural grass seeds. It is flat, with a rather broad, thin grain, and dark brown in color. The seeds average about 8 to 10 mm. long by 2 mm. wide, (three-eighths of an inch long by three thirty-seconds wide) and, as they appear in the trade, usually have no awn or beard, though sometimes a small awn is present.

## TESTING FOR PURITY.

To make a purity test of the seed the entire lot purchased should first be thoroughly mixed, and a small sample, say a heaping tablespoonful, should be taken and spread on a sheet of paper. The good seed can then be separated from the chaff, empty glumes, and spurious seeds. A small-bladed penknife will prove serviceable in this work, especially as many of the seeds will need to be pressed with the flat of the blade point in order to find whether or not they contain a grain. If they resist the pressure and remain firm they may be placed with the pure seed. If, however, they are soft and readily indented

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<sup>1</sup> The formula is  $15 : 87.3 :: x : 100$   
 $87.3) 1500 (17.1 +$

with the knife blade they are empty glumes and should be placed with the impurities. The chaff and sticks can, of course, be recognized at sight, and there will usually be little trouble in detecting any spurious seeds.

#### ADULTERANTS MOST LIKELY TO BE FOUND.

The adulterants most to be expected are meadow fescue, upright brome grass, and chess.

Meadow fescue (*Festuca pratensis*) (Fig. 1, *d*) is a much smaller seed than the beardless brome grass, and always tends to settle to the bottom of the pile. For this reason it is necessary to thoroughly mix a lot of seed before taking the sample, as otherwise the meadow fescue may be entirely overlooked, especially if the sample is taken from the top of the bag. The seed of meadow fescue is pale in color, 5 to 6 mm. (nearly one-fourth of an inch) long by 1.5 mm. (one-sixteenth of an inch) wide, and never has an awn.

The seed of upright brome grass (*Bromus erectus*) (Fig. 1, *a*) is much like that of beardless brome grass, but is more slender and has an awn or beard nearly as long as the seed.

The seeds of chess (*Bromus secalinus*) (Fig. 1, *b*) are larger than meadow fescue seeds, very thick, and with a round back, owing to the fact that the glumes turn in around the grain. Chess seeds are of a dirty straw color and have a short, usually somewhat bent, awn.

Among the weed seeds found in beardless brome grass the most frequent is a species of quack grass, either *Agropyron repens* (Fig. 1, *e*) or *A. tenerum*. Some of these are present in nearly every sample, and may be recognized by their slender shape and greenish straw color. They have no awn, but the tip is pointed. Frequently two or more seeds are found together in a cluster. Sometimes the seeds of a fescue (*Festuca bromoides*) (Fig. 1, *f*) are found. They can be readily distinguished by their slender shape and extremely long awn.

#### ESTIMATING THE PERCENTAGE OF PURITY.

When all the pure seed has been separated an estimate may be made of the percentage of impurity. Such an estimate can, of course, be only the merest approximation, but the writer gives the result of his experience in the hope that it may prove useful to some who have not at hand the balances necessary for an exact determination of the percentage. Assuming that the impurity is all, or practically all, chaff and empty glumes, he has found that the following estimates will be reasonably correct. If the impurities aggregate one-fourth of the total volume they will constitute between 10 and 15 per cent by weight of the sample; if one-third, 15 to 20 per cent; if one-half, about 25 per cent; if two-thirds, about 35 per cent; if three-fourths, about 40 per cent. If any of the above-mentioned adulterants are found the result

will be different, since these seeds weigh, seed for seed, about the same as the beardless brome grass.

It must not be forgotten that these estimates do not purport to be precise, but the writer's experience has been that, with care, fairly correct estimates may be made in this way.

#### THE GERMINATION TEST.

The seeds for the germination test should be counted out from the pure seed, planted in a box of soil, and kept in a warm place. A folded piece of flannel between two dinner plates, one inverted over the other, may also be used, but the writer has generally secured better results from the soil test for brome grass, and prefers to use it when possible. Whatever method is adopted the test should be conducted where the temperature will not fall much below  $45^{\circ}$  or  $50^{\circ}$  F. at night and will range about  $60^{\circ}$  or  $70^{\circ}$  during the day. In the soil tests the sprouts will begin to come up in six or seven days, and in about ten days or two weeks nearly all the good seeds will have sprouted. The sprouts can then be counted, the number compared with the number of seeds planted, and the percentage determined.

#### SOWING BROME GRASS SEED.

The chaffy nature of the commercial seed makes it impossible to use a drill successfully; it must, therefore, be broadcasted, and should be harrowed in or covered in some way. Professor Burnett of the South Dakota Station recommends covering to a depth of 2 inches. Whether or not such a depth will always be best will depend somewhat on the time and place of sowing. In all cases, however, it should be covered, as the seed is too light to settle into the cracks of the soil, and is in danger of being blown away.

#### SENDING SAMPLES FOR TEST.

Persons wishing to send samples to be tested, either to their State station or to the U. S. Department of Agriculture, should bear in mind that a large enough sample, selected with care, is all-important. The sample should be at least 2 ounces in weight or half a pint in volume and should be drawn after the entire lot has been thoroughly mixed.

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*In Charge of Pure Seed Investigations.*

Approved:

JAMES WILSON,

*Secretary of Agriculture.*

WASHINGTON, D. C., *March 10, 1900.*

